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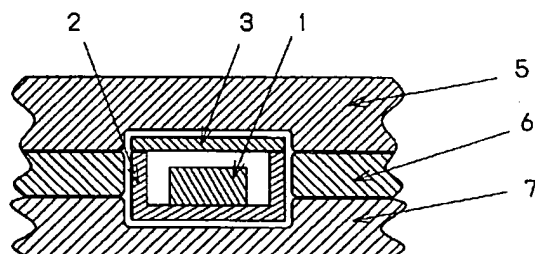
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(54) 【発明の名称】 スノーボード用磁気装置

(57) 【要約】

【課題】 靴の着脱が容易でかつ確実な、スノーボード用磁気装置を提供する。

【解決手段】 永久磁石を第1のヨークに固着し、第1のヨークをスノーボード本体に固着し、かつスノーボード本体とともに用いる靴には第2のヨークを固着したスノーボード用磁気装置。



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【特許請求の範囲】

【請求項1】 永久磁石を軟磁性金属部材からなる第1のヨークに固着し、当該第1のヨークをスノーボード本体に固着し、かつ当該スノーボード本体とともに用いる靴には軟磁性金属部材からなる第2のヨークを固着したことを特徴とするスノーボード用磁気装置。

【請求項2】 永久磁石を軟磁性金属部材からなる第1のヨークに固着し、当該第1のヨークをスノーボード本体に取り付けた靴固定具に固着し、かつ当該靴固定具と組み合わせて用いる靴には軟磁性金属部材からなる第2のヨークを固着したことを特徴とするスノーボード用磁気装置。

【請求項3】 前記第1のヨークには、前記靴固定具の固定位置を調整するためのボルトを通す複数の孔を設けたことを特徴とする請求項1、2のいずれかに記載のスノーボード用磁気装置。

【請求項4】 前記スノーボード本体と組み合わせて用いる靴の底部には、軟磁性金属部材からなる第2のヨークを固着したことを特徴とする請求項1～3のいずれかに記載のスノーボード用磁気装置。

【請求項5】 永久磁石を軟磁性金属部材からなる第1のヨークに固着し、当該第1のヨークをスノーボード本体に取り付けた靴固定具のトゥクリップ部に固着し、かつ当該靴固定具と組み合わせて用いる靴には、当該第1のヨークと対向する位置に軟磁性金属部材からなる第2のヨークを固着したことを特徴とする請求項1～4のいずれかに記載のスノーボード用磁気装置。

【請求項6】 前記第2のヨークを装着しない時に、前記磁石と前記第1のヨークとに軟磁性金属部材からなる第3のヨークを吸着させて用いることを特徴とする請求項1～5のいずれかに記載のスノーボード用磁気装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、雪上遊技用あるいは雪上競技用のスノーボードに靴を固定するための、磁気を利用した装置に関するものである。

【0002】

【従来の技術】近年スキー場でのスノーボード利用者が急激に増加している。ところが、ゲレンデのスノーボーダーが問題視される最も大きな原因の一つとして、リフト降り場周辺での「座り込み」が挙げられる。バインディングから靴を一度外さなければリフトに乗れないスノーボードの性格上、やむを得ないことではある。

【0003】そこで、できるだけ簡単確実に、すばやく装着できる機械的バインディングが各種提案され、実用化されている。すなわち、ハードブーツ仕様で踏み込むだけのステップイン方式、ブーツの踵の引っ張り穴にはめ込む方式、ブーツのソールにあるフックをバインディングに差し込む方式、ブーツの底に取り付けられたバーをバインディングにひっかける方式、スリッパのよう

に足を突っ込む方式、ベースとハイバックごと外す方式等々である。

【0004】また、バインディング（靴ホルダー）の底部に永久磁石を取り付けた構造を採用してスノーボードにバインディングを吸着させるという提案が例えば特開平8年第191916号公報に開示されている。

【0005】なお、スノーボードのバインディングは次のような点についても留意する必要がある。すなわち、転倒時足に異常な力が掛からぬよう緩衝機構ないし自動脱着機構が着いていること、使用者の足形や脚形へのフィット機構を備えること。

【0006】

【発明が解決しようとする課題】しかし、上記機械的バインディングの各方式は、いずれも高価格、物理的外力に対して故障しやすい、素早い装着のためには熟練を要する、イージーオンではあってもクイックリリースとは言い難い、等の問題点を幾つか残すものであった。

【0007】一方、特開平8年第191916号公報に開示された方法はリフト降り場周辺での「座り込み」対策としては無力である。すなわちバインディング（靴ホルダー）の着脱が仮に容易であったとしても靴のバインディングとの着脱は従来方法と変わらず、だからといってバインディングごと着脱してリフトに乗ったり雪上を歩行することは全く非現実的だからである。

【0008】さらに特開平8年第191916号公報に開示された方法による場合は、次のような実用上の難点があった。すなわち、バインディング（靴ホルダー）が磁石の厚さだけ厚くなり、靴の位置が高くなるので競技中の操作性が悪い。永久磁石やスノーボードに張られた鉄板は周辺の金属磁性材料をも吸着し、長期間の使用に耐えないし、また吸着物によっては危険である。バインディングの横応力に抗しての保持力が縦方向の吸着保持力に較べて極めて弱いため、競技中に脱着する可能性が高く、特に空中での競技中は極めて危険、等々の難点である。なおこの点について、従来の磁石を用いない機械的な方法ではボルト止めとしていたので安全であった。

【0009】かかる状況に鑑み、雪上遊技用あるいは雪上競技用のスノーボードに靴を固定するための磁気を利用した装置に関して、本発明が解決しようとする課題は以下の通りである。

【0010】すなわち、スノーボードとバインディングとの固定は安全確実であり、かつ靴のスノーボードからの取り外しやスノーボードへの取付が容易な装置であること。異常な外力に対して正しく脱離する装置であること。靴とスノーボードとの連結力が水平方向に対しても充分であって、かつ使用時も使用休止時（不使用時）も、不要の磁束漏れがなく、目的外異物を吸着しないこと。軽量小型で簡明な構造であり、以て高生産性かつ安価な装置であること。

【0011】

【課題を解決するための手段】上述の課題を解決するため鋭意研究の結果、本発明者らは、著しく構成を改善したスノーボード用磁気装置の発明に想到したものである。すなわち第1の発明は、永久磁石を軟磁性金属部材からなる第1のヨークに固着し、当該第1のヨークをはスノーボード本体に固着し、かつ当該スノーボード本体とともに用いる靴には軟磁性金属部材からなる第2のヨークを固着したスノーボード用磁気装置である。

【0012】この発明において第1のヨークや第2のヨークは、鉄系のアモルファス薄板を積層したものや安価な鉄板で作成してもよい。前者の場合は軽量化が図れる。

【0013】また第2の発明は、永久磁石を軟磁性金属部材からなる第1のヨークに固着し、当該第1のヨークをスノーボード本体に取り付けた靴固定具に固着し、かつ当該靴固定具と組み合わせて用いる靴には軟磁性金属部材からなる第2のヨークを固着したスノーボード用磁気装置である。

【0014】この発明において靴固定具とは、一般に言うバインディングあるいは靴ホルダーのことである。また、この靴固定具をスノーボード本体に取り付る方法は、例えば従来通りのボルトを用いる方法である。

【0015】第3の発明は前記第1～第2のいずれかに記載の発明において、前記第1のヨークには、前記靴固定具の固定位置を調整するためのボルトを通す複数の孔を設けたスノーボード用磁気装置である。この発明において第1のヨークは、靴固定具とスノーボード本体の両方に例えばボルトを用いて固定するのがよい。

【0016】第4の発明は前記第1～第3のいずれかに記載の発明において、前記スノーボード本体と組み合わせて用いる靴の底部には、軟磁性金属部材からなる第2のヨークを固着したスノーボード用磁気装置である。

【0017】第5の発明は前記第1～第4のいずれかに記載の発明において、永久磁石を軟磁性金属部材からなる第1のヨークに固着し、当該第1のヨークをスノーボード本体に取り付けた靴固定具のトゥクリップ部に固着し、かつ当該靴固定具と組み合わせて用いる靴には、当該第1のヨークと対向する位置に軟磁性金属部材からなる第2のヨークを固着したスノーボード用磁気装置である。

【0018】第6の発明は前記第1～第5のいずれかに記載の発明において、前記第2のヨークを装着しない時に、前記磁石と前記第1のヨークとに軟磁性金属部材からなる第3のヨークを吸着させたスノーボード用磁気装置である。

【0019】なお、前記第1～第5のいずれかに記載の発明において、前記第1のヨークと前記第3のヨークとは、可動部品を介して連結したスノーボード用磁気装置としてもよい。これを俗に表現すると、蝶番（ちょうつがい）の一方が永久磁石を使うときのヨークであり、蝶

番の他方が永久磁石を使わないときの蓋であり、この蓋は永久磁石の磁場を閉じこめる作用をする。

【0020】

【発明の実施の形態】以下に発明の実施の形態を図を用いて説明する。図1は発明の要点を説明するための断面の模式図であり、各部の縮尺を正確に記したものではない。図1においてスノーボード(7)にはバインディング(6)を例えばさらネジで固着し、バインディング(6)には靴の底部であるソール(5)を磁気的手段で、または機械的手段を補助手段とする磁気的手段で固定する。

【0021】上記スノーボード(7)、バインディング(6)、靴の底部であるソール(5)には以下の磁気装置を収納できるように切欠部ないし凹部を設ける。磁気装置は永久磁石(1)と第1のヨーク(2)と第2のヨーク(3)と、必要に応じて第3のヨーク(図示せず)とからなる。

【0022】永久磁石(1)は第1のヨーク(2)に固着し、これらは例えばバインディング(6)に固着する。一方、靴の底部であるソール(5)には第2のヨーク(3)を固着する。第3のヨークは競技遊技中は上記のいずれにも固着しない。

【0023】本発明では、スノーボード(7)とこれにボルトなどで固定したバインディング(6)との組合せ体に永久磁石(1)を設け、この永久磁石(1)は第1のヨーク(2)で3面以上を覆い、適宜分離して用いるスノーボード(7)用の靴の底部であるソール(5)に仕組んだ第2のヨーク(3)を吸着する。以下に図を参照しながら実施例の詳細を説明する。

【0024】

【実施例】

(実施例1) 図2、3は本発明の磁気装置に係る斜視図である。永久磁石(1)はネオジウム-鉄系材料で幅10mm長さ36mm厚さ3mmの棒磁石を用いた。最終的な着磁の方向は厚さ方向である。第1のヨーク(2)は厚さ2mmの軟鉄の板をコの字に折り曲げ作成した。その外形は幅19mm長さ40mm高さ6.5mmとし、表面にニッケルメッキを施したものをを用いた。第2のヨーク(3)は厚さ2mm幅19mm長さ40mmの軟鉄の板に、靴に固定するための穴を2箇所設けて作成した。また、第3のヨークとして、第2のヨーク(3)と同形状で鉄板の穴部に紐を取り付けたものも用意した。

【0025】以上の永久磁石とヨークとを4組作成し準備した後、上記永久磁石(1)を第1のヨーク(2)の内側に接着剤で固定し、固定側の磁気装置4個を作成した。続いて左右足用のそれぞれのバインディング(6)の各2個所に幅20mm長さ41mmの矩形の穴を設けた。これらの穴のそれぞれに上記固定側の磁気装置を挿入し接着剤で固定した。ここでは靴側でコの字が開くよ

うに、かつ上端を描えて固定した。

【0026】このバインディング(6)をスノーボード(7)に取り付けた場合に上記第1のヨーク(2)がスノーボード(7)と干渉する個所については、スノーボード(7)の一部に凹部を設け、干渉防止に供した。

【0027】上記バインディング(6)に組み合わせて用いる左右の靴の底部であるソール(5)には上記固定側の磁気装置と対向する位置に深さ1.5mm程度の凹部を設けた。この凹部に上記第2のヨーク(3)をあて、穴部を介して靴の金具にビス止めして靴に固定した。靴底面で第2のヨーク(3)は靴底と面を描えて露出している。

【0028】さらに上記バインディング(6)からは、足首固定ベルト(アンクルストラップ)とつま先固定ベルト(トゥストラップ)を取り外し、別途、脱靴用のてこによる脱靴レバーを取り付けた。

【0029】また、第3のヨークとして、第2のヨーク(3)と同形状の鉄板の穴部に紐を取り付けたものも用意した。

【0030】このようにして作成したスノーボード等を試用したところ、リフト乗降時の靴の着脱は極めて迅速かつ容易に可能となった。また全体的に軽量化し操作性がよかった。靴はバインディングから取り外した後は、歩行移動が自由にできるようになった。靴を取り外したバインディングには第3のヨークを吸着せしめたので、周辺の鉄類を吸引することがなく、また周辺の電子機器の磁場障害も未然に防ぐことができた。

【0031】(実施例2)実施例1と同構造の永久磁石(1)と第1のヨーク(2)による固定側の磁気装置を、スノーボード(7)に設けた凹部に接着剤で固定した。この固定は左右の脚位置相当部にそれぞれ5個を、スノーボード(7)の長手方向に同間隔にかつスノーボード(7)の表面から突出しないように配列して行った。

【0032】一方、靴の底部であるソール(5)には第2のヨーク(3)を実施例1と同じ要領で取り付けた。ただし片靴2個の前記第2のヨーク(3)の取付間隔は、前記配列された5個の第1のヨーク(2)の1個飛びの間隔に合わせた。また第3のヨーク(3)として、上記配列された5個または10個の永久磁石(1)を一

枚で覆える広さの鉄板を採用した。

【0033】このようにして作成されたスノーボードは、バインディングを特に用いなくても競技遊技が可能であった。吸着すべき永久磁石を選択することで、従来の脚位置調整が迅速簡単にでき、取扱性が飛躍的に向上した。広い第3のヨークの採用により、実施例1の効果に加えてさらに利便性が向上した。

【0034】(実施例3)図4、5は本発明の他の磁気装置に係る斜視図である。第1のヨーク(2)は厚さ2mmの軟鉄の板を基準面から2回折り曲げさらに一回折

り戻し、折り戻し部にはさらネジの頭が収まるような穴(4)を2個設けた。このようなヨークを2個用意し、これらの上記基準面同士を溶接で固定し、表面にニッケルメッキを施して第1のヨーク(2)を作成した。その外形は幅60mm長さ40mm高さ6.5mmである。穴(4)のピッチは幅方向に約5cm長さ方向に約2cmとした。

【0035】この第1のヨーク(2)の凹部に実施例1、2と同じ材質形状の2個の永久磁石(1)を並列に配置し接着剤で固定し固定側の磁気装置とした。第2のヨーク(3)は厚さ2mm幅38mm長さ40mmの軟鉄の板に、靴の底部であるソール(5)に固定するための穴を4個所設けて作成した。また、第3のヨークとして、第2のヨーク(3)と同形状の鉄板の穴部に紐を取り付けたものも用意した。同様にして固定側の磁気装置と第2、第3のヨークとを2組準備した。

【0036】続いて左右足用のそれぞれのバインディング(6)の各1個所に幅39mm長さ41mmの矩形の穴を設けた。これらの穴のそれぞれに上記固定側の磁気装置を挿入し、この磁気装置に設けた穴(4)を介して上記バインディング(6)とともにさらネジでスノーボード(7)に固定した。スノーボード(7)側の雄ネジは上記バインディング(6)を固定するために設けられた一般仕様のものでそのまゝ用いた。

【0037】また実施例1と同様の要領で、第2のヨーク(3)は靴の底部であるソール(5)に取り付け、上記バインディング(6)からは足首固定ベルト(アンクルストラップ)とつま先固定ベルト(トゥストラップ)を取り外し、別途、脱靴用のてこによる脱靴レバーを取り付けた。

【0038】このようにして作成したスノーボード等を試用したところ、実施例1と同様の効果に加えて、バインディングの位置決め機構を活用することができ、操作性がさらに改善した。

【0039】(実施例4)バインディング(6)のトゥクリップ部を残し、これに実施例1の固定側の磁気装置(図2に示したもの)と同じものを接着固定した。また靴の対応するつま先部に実施例1の第2のヨーク(3)と同じもの(図3に示したもの)を同じ要領で装着した。さらに第3のヨークも実施例1と同要領で準備した。その他の部分はすべて実施例1と同様にしたものを作成した。

【0040】このようにして作成したスノーボード等を試用したところ、実施例1と同様の効果に加えて、バインディングのフィット感がさらに向上した。

【0041】

【発明の効果】以上詳細に説明したように、本発明によって、以下の効果が得られた。すなわち、スノーボードとバインディングとの固定は安全確実であり、かつ靴のスノーボードからの取り外しやスノーボードへの取付が

容易な装置が提供できた。本装置は異常な外力に対して正しく脱離した。靴とスノーボードとの連結力は水平方向に対しても充分であって、かつ本装置は使用時も使用休止時（不使用時）も、不要の磁束漏れがなく、目的外異物を吸着しなかった。さらに軽量小型で簡明な構造であるから、高生産性かつ安価な装置となった。

【0042】使用方法に関連づけた説明を補足すると以下の通りである。すなわち、本発明の適用により、ゲレンデのスキーリフトに乗っている時スノーボーダーは、スノーボードとバインディングの組合せ体を携え、これとは分離した靴のみを装着できる。スキーリフトから降りる時は、この靴をバインディングに押しつけるようにしながら上記永久磁石の第1のヨークと上記靴の第2のヨークとを磁氣的に吸着せしめ、速やかに競技、遊技に移行できる。

【0043】この時、第1のヨークと第2のヨークとは吸着位置の自由度が互いに適度に抑制されている、すなわち第1のヨークの開口部よりも第2のヨークの外形の方が同等ないしやや大であるため、本発明の磁気装置は上記靴の位置決め機能ないし位置矯正機能をも有する。

【0044】さらにバインディングと靴とを機械的に固定する必要がない（機械的な固定を補助的に用いてもよい）ので、スノーボードの装着はワンタッチで済むことになる。

【0045】上記靴を装着しかつ競技、遊技をしてい

い時、すなわちスノーボードを外して、例えば歩行や休憩をしている時は、第1のヨークと永久磁石とに第3のヨークを装着し、鉄屑等を吸着しないようにする。靴に装着した第2のヨークは永久磁石を伴わないので鉄屑等を吸着する心配はない。

【0046】第1のヨークは永久磁石の吸着力を向上せしめるので、結果的にスノーボードおよびバインディング側の小型軽量化が計れる。また、靴は第2のヨークを有するが永久磁石を伴わないので軽量となる。

【図面の簡単な説明】

【図1】本発明に関する容部の模式的な断面図である。

【図2】本発明の一実施例に関する容部の斜視図である。

【図3】本発明の一実施例に関する他の容部の斜視図である。

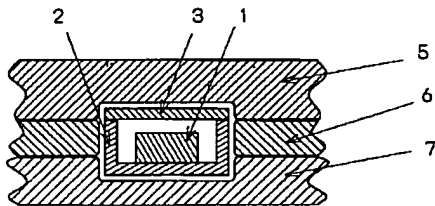
【図4】本発明の他の実施例に関する容部の斜視図である。

【図5】本発明の他の実施例に関する他の容部の斜視図である。

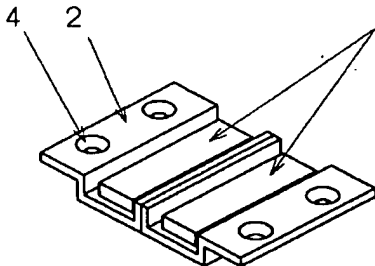
【符号の説明】

- 1 永久磁石
- 2 第1のヨーク
- 3 第2のヨーク
- 5 ソール
- 6 バインディング
- 7 スノーボード

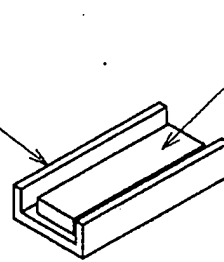
【図1】



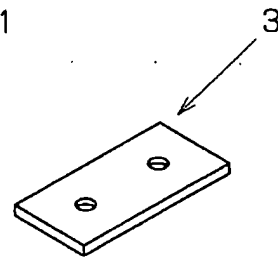
【図4】



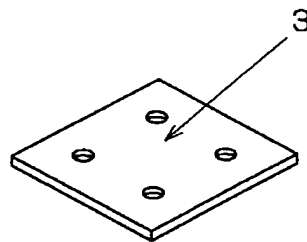
【図2】



【図3】



【図5】



PUB-NO: JP410314365A
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TITLE: MAGNETIC DEVICE FOR SNOWBOARD

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INT-CL (IPC): A63 C 9/086; A63 C 5/00; A63 C 9/02

ABSTRACT:

PROBLEM TO BE SOLVED: To safely and securely fix a snowboard and a binding device and facilitate the fixing or unfixing manipulation of shoes from the snowboard, by fixing the first yoke on which a permanent magnet is firmly stuck to the snowboard body and firmly fixing the second yoke to the shoes used together with the snowboard body.

SOLUTION: A permanent magnet 1 is fixed to the inside of the first yoke 2 with an adhesive to form a fixing side magnetic device. Then, rectangular holes are formed at respective two positions of binding devices 6 for the right and left feet and the fixing side magnetic devices are inserted into respective holes and fixed with the adhesive. A recess is formed at a part of the snowboard where the first yoke 2 interferes with the snowboard 7 to prevent the interference when the binding device 6 is fitted to the snowboard 7. A recess is formed at the opposite position against the fixing side magnetic device in the sole 5 of the bottom of the right and left shoes combined with the binding devices 6 and the second yoke 3 is fitted to the recess and fixed to the shoe by fixing it to metal tools of the shoe with screws through the hole.

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PN=10-314365*

MAGNETIC DEVICE FOR SNOWBOARD
[Sunoobodo you jikisouchi]

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UNITED STATES PATENT AND TRADEMARK OFFICE
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[Claims]

[Claim 1] A magnetic device for a snowboard characterized by a permanent magnet being fixated to a first yoke consisting of a soft magnetic metal member, by said first yoke being fixated to the main unit of a snowboard, and by a second yoke consisting of a soft magnetic metal member being fixated to a shoe which is used together with said main unit of the snowboard.

[Claim 2] A magnetic device for a snowboard characterized by a permanent magnet being fixated to a first yoke consisting of a soft magnetic metal member, by said first yoke being fixated to a shoe fastener attached to the main unit of a snowboard, and by a second yoke consisting of a soft magnetic metal member being fixated to a shoe which is used in combination with said shoe fastener.

[Claim 3] A magnetic device for a snowboard of either Claim 1 or 2 characterized by said first yoke being provided with multiple holes through which bolts are put in order to adjust the fastening position of said shoe fastener.

[Claim 4] A magnetic device for a snowboard of one of Claims 1 ~ 3 characterized by the second yoke consisting of a soft magnetic metal member being fixated to the bottom part of a shoe which is used in combination with said snowboard's main unit.

[Claim 5] A magnetic device for a snowboard of one of Claims 1 ~ 4 characterized by the permanent magnet being fixated to the first yoke consisting of a soft magnetic metal member, by said first yoke being fixated to the toe-clip part of the shoe fastener that is attached to the snowboard's main unit, and by the second yoke consisting of a soft magnetic

metal member being fixated to the shoe that is used in combination with said shoe fastener at a position at which it opposes said first yoke.

[Claim 6] A magnetic device for a snowboard of one of Claims 1 ~ 5 characterized by allowing a third yoke consisting of a soft magnetic metal member to be adsorbed to said magnet and said first yoke when said second yoke is not attached.

[Detailed Explanation of the Invention]

[0001] [Field of Industrial Application]

The present invention pertains to devices for fixating shoes onto snowboards for recreation on snow or competitive sports on snow by utilizing magnetism.

[0002] [Related Art]

The number of snowboard users in ski resorts has rapidly increased in recent years. However, one of the biggest factors that is causing snowboarders on slopes to be viewed as a problem is the fact that they sit down in lift-drop areas. However, this is inevitable due to the nature of snowboards, since snowboarders need to remove their shoes from the bindings before riding a lift.

[0003] In light of this, various types of mechanical bindings that can be swiftly and securely attached with as much ease as possible have been suggested and put to practical use. These include a step-in system in which a hard boot is simply stepped into the binding, a system in which a projection located at the heel of a boot is clicked into a hole, a system in which a hook located at the sole of a boot is inserted into a binding, a system in which a bar attached to the bottom of a boot is hooked onto a binding, a slipper-like system into which a foot is jammed, and a system

in which the base and high back are removed together.

[0004] Moreover, Kokai No.08-191916 suggests that a permanent magnet be attached to the bottom of a binding (shoe holder) and that the binding be adsorbed by the snowboard.

[0005] Moreover, the following points must be considered for snowboard bindings: a buffering mechanism or an automatic release mechanism is equipped in order to prevent excessive force from being applied to the foot at the time of falling; and a mechanism that allows the binding to fit the user's foot shape or leg shape is equipped.

[0006] [Problems that the Invention is to Solve]

However, all of the above mechanical binding systems still have some problems such as the fact that they are expensive, are likely to be broken by an external physical force, cannot be attached quickly without skill, cannot be quickly released even though they can be attached easily, etc.

[0007] Meanwhile, the method indicated in Kokai No.08-191916 is useless as a countermeasure for snowboarders sitting down in the lift-drop areas. In other words, even though the attaching and releasing of the binding (shoe holder) is easy, the method for attaching the shoe to and releasing it from the binding is the same as in the past, and yet it is completely unrealistic to ride lifts or walk on snow after releasing the binding itself.

[0008] The method indicated in Kokai No.08-191916 also had the following problem in terms of practical use. In other words, the binding (shoe holder) becomes thicker due to the thickness of the magnet, and the position of the shoe therefore becomes higher. This makes the operability poor for competitions. The permanent magnet and the iron plate

attached to the snowboard even adsorb magnetized metallic materials, and therefore, they do not last for a long time and may even be dangerous depending on the adsorbed object. Since the holding power of the binding in response to transversal stress is much weaker than the adsorption holding power in the vertical direction, it is highly probable that it will become detached while snowboarding, and it is particularly dangerous when the user is in mid-air while snowboarding. The conventional mechanical method which utilizes a bolt as a stopper instead of a magnet was safe in terms of this point.

[0009] In light of such a situation, the present invention reaches the following goals by utilizing magnetism in a device that is for fixating a shoe to a snowboard for recreation on snow or competition on snow.

[0010] In other words, the following are required of the device. The snowboard and binding must be fixated to each other safely and securely. It must be easy to remove the shoe from or attach it to the snowboard. The device must be correctly detached in response to an excessive external force. The attaching force between the shoe and the snowboard must also be sufficient in the horizontal direction. There must be no leakage of unnecessary magnetic flux that may adsorb nontarget foreign matter both during use and nonuse. The device must have a small, light-weight, and simple structure, be inexpensive, and have a high productivity rate.

[0011] [Means for Solving the Problem]

As a result of diligently studying to achieve the above goals, the present inventors completed a magnetic device for a snowboard with a significantly improved structure. In other words, the first invention

is a magnetic device for a snowboard in which a permanent magnet is fixated to a first yoke consisting of a soft magnetic metal member, in which said first yoke is fixated to the main unit of a snowboard, and in which a second yoke consisting of a soft magnetic metal member is fixated to a shoe which is used together with said main unit of the snowboard.

[0012] The first yoke and the second yoke mentioned in this invention may be made with laminates of iron-type amorphous thin plates or inexpensive iron plates. The former will contribute to weight reduction.

[0013] The second invention is a magnetic device for a snowboard in which a permanent magnet is fixated to a first yoke consisting of a soft magnetic metal member, in which said first yoke is fixated to a shoe fastener attached to the main unit of a snowboard, and in which a second yoke consisting of a soft magnetic metal member is fixated to a shoe which is used in combination with said shoe fastener.

[0014] The shoe fastener mentioned in this invention is generally called binding or shoe holder. Moreover, the method for attaching this shoe fastener to the snowboard's main unit is, for example, the conventional method of using bolts.

[0015] The third invention is, with respect to either said first or second invention, a magnetic device for a snowboard in which said first yoke is provided with multiple holes for putting bolts through in order to adjust the fastened position of said shoe fastener. In this invention, the first yoke should be fixated to both the shoe fastener and the snowboard's main unit by using, for example, bolts.

[0016] The fourth invention is, with respect to one of said first through third inventions, a magnetic device for a snowboard in which the

second yoke consisting of a soft magnetic metal member is fixated to the bottom part of a shoe which is used in combination with said snowboard's main unit.

[0017] The fifth invention is, with respect to one of said first through fourth inventions, a magnetic device for a snowboard in which a permanent magnet is fixated to the first yoke consisting of a soft magnetic metal member, in which this first yoke is fixated to the toe-clip part of the shoe fastener that is attached to the snowboard's main unit, and in which the second yoke consisting of a soft magnetic metal member is fixated to the shoe that is used in combination with the shoe fastener at a position at which it opposes the first yoke.

[0018] The sixth invention is, with respect to one of said first through fifth inventions, a magnetic device for a snowboard in which a third yoke consisting of a soft magnetic metal member is adsorbed to said magnet and said first yoke when said second yoke is not attached.

[0019] Moreover, in one of said first through fifth inventions, the magnetic device for a snowboard may have said first yoke and said third yoke linked with each other by means of a movable component. To explain this in common terms, one side of the hinge acts as a yoke when a permanent magnet is utilized and the other acts as a lid when a permanent magnet is not utilized, and this lid seals in the magnetic field of the permanent magnet.

[0020] [Working Modes of the Invention]

In the following, working modes of the invention will be explained by using drawings. Figure 1 is a model drawing of a cross section that is for explaining the essential point of the invention and does not

accurately reflect the scale of each part. In Fig. 1, a binding [6] is fixated to a snowboard [7] by means of, for example, a Phillips-head screw, and a sole [5], which is the bottom part of a shoe, is fixated to the binding [6] by a magnetic means with or without a mechanical auxiliary means.

[0021] The above snowboard [7], binding [6], and sole [5], which is the bottom part of the shoe, are provided with a cutout part or a depressed part so that the following magnetic device can be stored. The magnetic device consists of a permanent magnet [1], a first yoke [2], a second yoke [3], and if necessary, a third yoke (not shown).

[0022] The permanent magnet [1] is fixated to the first yoke [2] and these are fixated to, for example, the binding [6]. Meanwhile, the second yoke [3] is fixated to the sole [5], which is the bottom of the shoe. The third yoke is not fixated to any of those mentioned earlier while the snowboard is being used.

[0023] According to the present invention, a permanent magnet [1] is provided to a body that is a combination of the snowboard [7] and the binding [6], which is fixated to the snowboard [7] with bolts, etc. The permanent magnet [1] has three or more of its faces covered by the first yoke [2] and adsorbs the second yoke [3] set in the sole [5], which is the bottom part of a shoe for the snowboard [7]. In the following, the details of the working examples will be explained by referring to drawings.

[0024] [Working Examples]

(Working Example 1)

Figure 2 and 3 are perspective drawings pertaining to the magnetic device of the present invention. As the permanent magnet [1], a rod magnet

that was a neodymium-iron type material and that was 10mm in width, 36mm in length, and 3mm in thickness was utilized. The final magnetizing direction was the thickness direction. A first yoke [1] was made by bending a 2mm-thick soft-iron plate into a \sqsupset shape. Its external dimensions were made to be 19mm in width, 40mm in length, and 6.5mm in height, and an article that had nickel-plated surfaces was utilized for it. A second yoke [3] was made by providing two shoe-fixating holes to a soft-iron plate that was 2mm in thickness, 19mm in width, and 40mm in length. Moreover, as a third yoke, an article that had the same shape as the second yoke [3] and that had strings attached to the hole parts of the iron plate was also prepared.

[0025] After making and preparing 4 groups consisting of the above permanent magnets and yokes, the above permanent magnets [1] were fixated to the inner sides of the first yokes [2] by means of an adhesive to make 4 fixed-side magnetic devices. Next, rectangular holes that were 20mm in width and 41mm in length were provided to 2 locations of each of the left-foot and right-foot bindings. The above fixed-side magnetic devices were inserted through these holes and were fixated with an adhesive. In this case, they were fixated after having their upper ends aligned and in a manner such that \sqsupset shapes would be formed on the shoe side.

[0026] At locations at which the above first yokes [2] and the snowboard [7] would interfere with each other while these bindings [6] were attached to the snowboard [7], depressed parts were provided to the snowboard [7] in order to prevent the interferences.

[0027] The soles [5], which are the bottom parts of left and right

shoes and which are combined with the above bindings [6] to be utilized, were provided with about 1.5mm-deep depressed parts at locations at which they opposed the above fixed-side magnetic devices. While being placed against these depressed parts, the above second yokes [3] were fixated to the shoes by being screwed to the shoe's fastener through the holes. The second yokes [3] were exposed at the bottom surfaces of the shoes with their surfaces aligned with the bottom surfaces of the shoes.

[0028] Moreover, the ankle straps and the toe straps were removed from the above bindings [6], and shoe-removing levers were attached separately.

[0029] Also, iron plates that had the same shape as the second yokes [3] and that had strings attached to their holes were prepared as the third yokes.

[0030] The snowboard created in this manner was tested. As a result, the attaching and detaching of the shoes at the time of riding on or off of lifts became very swift and easy. Moreover, its overall weight was reduced and the operability improved. As for the shoes, it became possible to walk freely with them after they were detached from the bindings. Since the bindings adsorbed the third yokes after the shoes were removed, the surrounding ferrous metals, etc. did not become drawn, and it was also possible to prevent magnetic field troubles of surrounding electronic apparatuses.

[0031] (Working Example 2)

Fixed-side magnetic devices that had the same structures as those of Working Example 1 and that consisted of permanent magnets [1] and first yokes [2] were fixated to depressed parts provided to the snowboard [7]

with an adhesive. 5 of these devices were fixated to each of the portions that corresponded to the left-foot or right-foot location at the same intervals in the length direction of the snowboard [7] in a manner such that they did not protrude from the surface of the snowboard [7].

[0032] Meanwhile, the second yokes [3] were attached to the soles [5], which are the bottom parts of shoes, in the same manner as in Working Example 1. Note, however, that the attachment interval of said 2 second yokes [3] provided to each shoe was matched to the interval between every other first yoke [2], 5 of which were aligned as mentioned earlier. Moreover, as a third yoke [3], 1 sheet of iron plate large enough to cover the above 5 through 10 aligned permanent magnets [1] was utilized.

[0033] The snowboard created in this manner could be used without requiring the use of the bindings. By selecting the permanent magnets to be adsorbed, adjusting of feet positions became swift and easy, and the ease of handling improved substantially. In addition to the effects of Working Example 1, the convenience increased even more by utilizing large third yokes.

[0034] (Working Example 3)

Figures 4 and 5 are perspective drawings related to another magnetic device of the present invention. A first yoke [2] was obtained as follows. A soft-iron plate was bent twice from the datum surface, was bent back one more time, and was provided with two holes [4] at the bent-back portion in which screw heads would fit. Two of such yokes were prepared and the above datum surfaces were fixated to each other by means of welding. By then nickel-plating the surfaces, a first yoke [2] was prepared. Its external dimensions were 60mm in width, 40mm in length, and 5.6mm in height.

The pitches of the holes [4] were made to be about 5cm in the width direction and about 2cm in the length direction.

[0035] Two permanent magnets [1] of the same material and shape as those of Working Examples 1 and 2, were arranged in parallel in the depressed parts of this first yoke [2] in order to obtain a fixed-side magnetic device. A second yoke [3] was made by providing a soft-iron plate that was 2mm in thickness, 38mm in width, and 40mm in length with 4 holes for fixating it to the sole, which is the bottom part of a shoe. Moreover, an iron plate of the same shape that has strings attached to the holes was also prepared as a third yoke [3]. In this manner, two groups consisting of fixed-side magnetic devices and second and third yokes were prepared.

[0036] Next, one rectangular hole that was 39 mm in width and 41 mm in length was provided to each of the left-foot and right-foot bindings [6]. The above fixed-side magnetic devices were inserted to each of these holes and were fixated to a snowboard [7] together with the above bindings [6] via the holes [4] provided to the magnetic devices. As the female screws for the snowboard [7] side, those of the general specifications provided for fixating the above bindings [6] were utilized without alteration.

[0037] Moreover, in the same manner as in Working Example 1, the second yokes [3] were attached to the soles [5], which are the bottom parts of shoes, ankle straps and toe straps were detached from the above bindings [6], and shoe-removing levers were attached separately.

[0038] The snowboard created in this manner was tested. In addition to the effects of Working Example 1, the use of binding positioning mechanisms further improved the operability.

[0039] (Working Example 4)

The toe-clipping parts of bindings [6] were kept, and fixed-side magnetic devices that were the same as those of Working Example 1 (shown in Fig. 2) were attached and fixated to them. Moreover, second yokes (3) that were the same as those of Working Example 1 (shown in Fig. 3) were attached in the same manner to the toe parts, which corresponded to shoes. Moreover, third yokes were also prepared in the same manner as in Working Example 1. All of the other parts were prepared in the same manner as in Working Example 1.

[0040] The snowboard created in this manner was tested. As a result, in addition to the effects of Working Example 1, the sense of fitting of the bindings improved even more.

[0041] [Effects of the Invention]

As explained in detail earlier, the following effects were obtained by the present invention. In other words, it was possible to provide devices that made the fixation of the snowboard and the bindings safe and secure and that made it easy to attach and detach shoes to and from snowboards. These devices became released correctly in response to an excessive external force. The forces connecting the shoes and snowboard were sufficient also in the horizontal direction. Moreover, there was no leakage of unneeded magnetic flux from the present devices both during use and nonuse and therefore did not adsorb nontarget foreign matters. Moreover, since their structures are small, light-weight, and simple, the devices could be made at a high productivity rate and at a low cost.

[0042] The following is an additional explanation related to the usage method. When the present invention is applied, a snowboarder riding

on a lift over a ski slope carries the combined body of a snowboard and bindings and can wear only shoes that are separate from the combined body. When getting off of a ski lift, the above first yokes containing the permanent magnets and the above second yokes of the shoes are magnetically adsorbed to each other while the shoes are pressed against the bindings. This way, the transition to snowboarding can be made swiftly.

[0043] At this time, the flexibility of the adsorbing positions between the first yokes and second yokes are appropriately controlled in a mutual manner. In other words, since the external dimensions of the second yokes are equal to or slightly larger than the openings of the first yokes, the magnetic devices of the present invention even have the above shoe positioning function or a position correcting function.

[0044] Moreover, since it is not necessary to fixate the bindings and shoes mechanically (It is permissible to utilize auxiliary mechanical fixation.), the snowboard can be attached by one-touch operation.

[0045] When the snowboarder is wearing the above shoes but not using the snowboard, in other words, when the snowboarder is walking or resting with the snowboard off, the third yokes are attached to the first yokes and permanent magnets so that iron scraps, etc. will not be drawn to them. Therefore, there is no risk of iron scraps, etc. being adsorbed since the second yokes attached to the shoes do not have permanent magnets.

[0046] Since the first yokes increase the adsorptive power of the permanent magnets, reductions in size and weight can be achieved on the binding side as a result. Moreover, the shoes, which have the second yokes but not the permanent magnets, become lighter in weight.

[Brief Explanation of the Drawings]

[Figure 1] A model cross-sectional drawing of an essential part of the present invention.

[Figure 2] A perspective drawing of an essential part of one working example of the present invention.

[Figure 3] A perspective drawing of another essential part of one working example of the present invention.

[Figure 4] A perspective drawing of an essential part of another working example of the present invention.

[Figure 5] A perspective drawing of another essential part of another working example of the present invention.

[Explanation of the Reference Numerals]

[1] = permanent magnet

[2] = first yoke

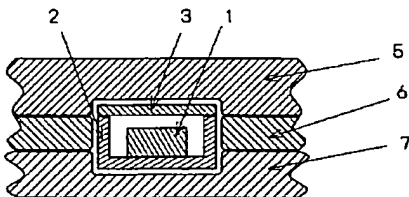
[3] = second yoke

[5] = sole

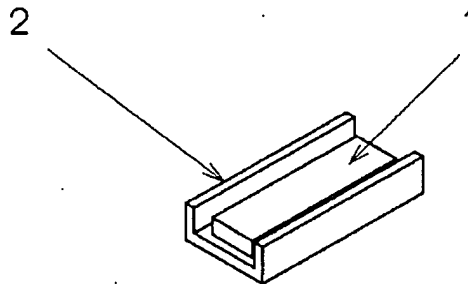
[6] = binding

[7] = snowboard

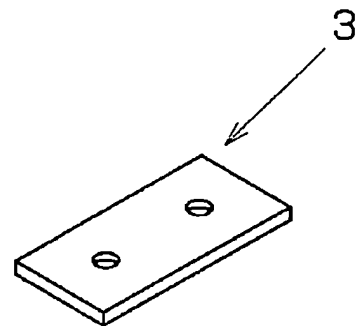
[Figure 1]



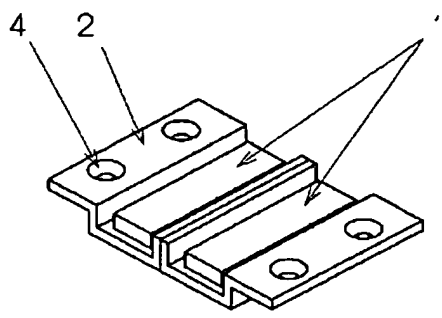
[Figure 2]



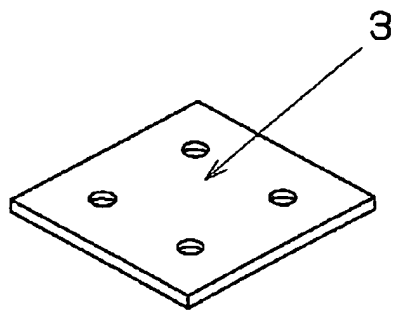
[Figure 3]



[Figure 4]



[Figure 5]



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